

# **LED DISPLAY HAVING LIGHT GUIDE PLATE**

## **BACKGROUND OF THE INVENTION**

### **Field of the Invention**

The present invention relates to LED display that is applied to  
5 household appliances, computer equipments, electronic instruments,  
communication apparatuses, and the likes, and more particularly to the  
LED display wherein the display screen can form a light screen effect.

### **Description of the Prior Arts**

Nowadays, displays for displaying characters and graphics  
10 generally includes vacuum fluorescent display (VFD), electro-  
luminescent display (EL), light emitting diode (LED) and liquid crystal  
display (LCD), which are often applied to all kinds of products, such as  
acoustic equipments, household appliances, computer, communication  
apparatuses or display control panel for electronic instruments.

15 The VFD, EL and the LED can display characters or graphics  
directly, whereas the LCD should be incorporated with back light source  
with even brightness. Taiwan PT. No. 200302375 discloses a LCD with  
back light source assembly, wherein the back light source assembly  
comprises a light assembly and a light guide plate. And it is noted that  
20 the back light source assembly is set at the rear of display screen  
assembly of the LCD (far away from the user). By such arrangements, the  
light projected into the light guide plate by the light assembly can reflect  
and passes through the light guide plate, and thus enables the light guide  
plate to form surface light source, and then the light of the light guide  
25 plate can be evenly projected on the LCD, whereby to improve the  
brightness of the LCD.

No matter what type of display, the design of which only  
emphasizes on function for displaying the graphics or characters, or the

brightness. To solve the brightness problem, the above-mentioned LCD of Taiwan PT. No.200302375 provides a special configuration which is aimed at the light guide plate of the back light source assembly. However, as far as the visual perception is concerned, none of the conventional displays is designed and structured by taking it into consideration.

The present invention has arisen to mitigate and/or obviate the afore-described disadvantages of the conventional LED display.

### **SUMMARY OF THE INVENTION**

The primary object of the present invention is to provide a LED display having light guide plate, wherein a light guide plate is set in front of a display screen of the LED display, and plural different colored light sources are used to project light into the light guide plate, so as to form colorful light screen in the direction of user's sight.

The secondary object of the present invention is to provide a LED display having light guide plate, wherein a light guide plate is set in front of a display screen of the LED display, and plural different colored light sources are used to project light into the light guide plate at different turns, so as to bring about dynamic changes in color.

The third object of the present invention is to provide a LED display having light guide plate, wherein a light guide plate is set in front of a display screen of the LED display, and plural colored light sources are used to project light into the light guide plate, such that the color of the light projected by the light source can be mixed with the color of the display screen, so as to improve the color display effect.

The present invention will become more obvious from the following description when taken in connection with the accompanying drawings, which shows, for purpose of illustrations only, the preferred embodiment in accordance with the present invention.

## **BRIEF DESCRIPTION OF THE DRAWINGS**

Fig. 1 is a partial outside view of a household appliance equipped with a LED display in accordance with the present invention;

Fig. 2 is an assembly view of a LED display in accordance with  
5 the present invention;

Fig. 3 is a structural view of a LED display with SMD Lamp in accordance with the present invention;

Fig. 4 is an illustrative view of showing traveling path of the light projected by light source of a LED display in accordance with the  
10 present invention;

Fig. 5 is a structural view of a LED display in accordance with another embodiment of the present invention.

## **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

15 Referring to Fig. 1, wherein a LED display 10 in accordance with the present invention is normally applied to household appliances 20, and it is capable of displaying characters and graphics. Besides the product shown in Fig. 1, the LED display 10 of the present invention 10 is also applied to computer equipments, electronic instruments, communication apparatuses, and the likes.  
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Referring to Fig. 2, wherein the LED display 10 is provided at a side with a display screen 12 for displaying characters or graphics, while on the other side opposite to the display screen 12 is defined with plural pins 14 which are employed to insert in a circuit board 16, so as to be  
25 connected to the circuit of the circuit board 16, and thus the display screen 12 is able to display characters or graphics.

A light guide plate 30 is fixed to shell of the house appliances 20 and corresponds to the display screen 12 of the LED display 10. It is

noted that the light guide plate 30 can be made of light-transmittance material, and the light guide plate 30 can be fixed to the shell of the house appliances 20 by engaging or inserting method. Since the engaging or inserting method is not the main technical characteristics of the present invention, it is omitted here.

At least a light source 40 serves to project light into the light guide plate 30, and it includes luminous portion 42 and pin portion 44. Wherein the pin portion 44 can be electrically connected to the circuit board 16 or can be inserted directly in the circuit board 16. The luminous portion 42 is set at a side of the light guide plate 30 or inserted in the side of the light guide plate 30, such that the light can be projected into the light guide plate 30 when the light source 40 is lighting.

The above-mentioned light source 40 can be LED lamp, or surface mount device (SMD) lamp 50 (as shown in Fig. 3). The SMD lamp 50 also should be electrically connected to the circuit board 16, and in like manner, it is set at or inserted in a side of the light guide plate 30. Whatever the light source 40 is LED lamp or SMD lamp, it can be plural in number, and different light source 40 can be provided with different color light.

In the above-mentioned embodiment, the light source 40 serves to project light into the light guide plate 30. When the light reflects in the light guide plate 30 and passes through it, the light guide plate 30 form colorful light screen. If the light guide plate 30 is provided with plural light sources 40 with different colors, wherein the plural light sources 40 project light by turns or at once, in this manner, with the variation in sequence of light or mixture of the light, the light guide plate 30 is provided with different displaying effects.

Referring to Fig. 4, after being reflected, the light 41 can pass

through the light guide plate 30 and projects on the display screen 12 of the LCD display 10. And then the light will turn into another color after it is reflected by the display screen 12 and passes through the light guide plate 30 since the color the light is mixed with the color of the display screen 12. In order to more clearly disclose the travel path of the light, the above-mentioned drawings don't show the reflection phenomenon when the light passes through different transmitter substances. And it has no influence on the effect of the light guide plate 30 when the light reflection phenomenon is neglected.

To make sure that the light 41 projected by the light source 40 can be truly reflected and focused, the surface of the light guide plate 30 is formed with transmission structures 31 by etching or other suitable means, so as to improve the transmission efficiency of the light source.

Besides being set at the side of the light guide plate 30, the light source 40 also can cooperate with the light guide plate 30 by other ways. With reference to Fig. 5, wherein the light source 40 is disposed on the circuit board 16, the light guide plate 30 is provided at both sides with extension 32, and the distal end of the extension 32 preferably extends toward the circuit board 16. In this way, the luminous portion 42 of the light source 40 corresponds to the extension 32 of the light guide plate 30, or it can be inserted in the extension 32. Since the extension 32 and a main visual screen 34 of the light guide plate 30 define an angle, a reflection plane 36 can be defined between the extension 32 and a main visual screen 34. In this way, the light of the light source 40 can be reflected into the main visual screen 34 after it projects on the reflection plane 36, and thus the light guide plate 30 can form a light screen. The reflection plane 36 can be shaped in the form of oblique plane or curved plane, and more preferably on the outer surface of the reflection plane 36

can be adhered with light-tight reflecting film or reflecting paper, so as to improve the light reflecting effect.

All the structures disclosed in the above-mentioned embodiments can enable the light guide plate 30 in front of the display screen 12 of the LED display 10 to form light screen. However, the real operation, it can be incorporated with a controlling device for controlling the brightness of the light source 40 and the LED display 10, so as to select desired hue for display. In other words, the light guide plate 30 in accordance with the present serves to provide different transmission colors, so as to provide dynamic changes in color.

While we have shown and described various embodiments in accordance with the present invention, it should be clear to those skilled in the art that further embodiments may be made without departing from the scope of the present invention.